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Forks of the Cuyahoga:

Pre-Glacial, Inter-Glacial and Post-Glacial.

BY COL. CHAS. WHITTLESEY.

This region is interesting historically and for its varied scenery, but especially on account of its geology. At the village of Cuyahoga Falls is the head of a romantic gorge, with vertical walls of rock, through which the river in high water rushes over rapids, chutes and cataracts, a distance of about four miles, with frightful velocity.

In a state of nature this chasm, glen or canyon, was overhung by a shadowy fringe of trees, behind which was a dense forest, obstructing the light of day.

The sombre and impressive character of the scene was heightened by the color of the water; the drainage of numerous swamps, which gave it a dark chocolate tinge.

In the days of my early youth, at our home in Tallmadge, three miles distant, I have frequently heard in still evenings a dull, monotonous roar, like that of Niagara, coming from this gorge. It will be seen that there are other resemblances to Niagara, especially that part below the Whirlpool. From this point to Lewiston the present gorge is more recent than the glacial times. Prof. Read, Dr. Moses Jewett and Prof. Claypole are agreed that the deepest part of the Cuyahoga canyon, which is below the angle at the high bridge, is also post-glacial. Like Niagara, there has been here a rapid undermining process, by means of a powerful current pouring over the edge of a hard stratum, originally a hundred feet high, upon soft shales beneath it. At the debouche into the present Cuyahoga Valley, near the Forks, during the occupation of red men, there were villages of that race, to which these four principal trails led. This location had for savages many important advantages. It could be reached in canoes from Lake Erie. By the Great Portage trail the waters of the Upper Muskingum, or Tuscarawas, were only seven miles distant. This distance is not so great but they carried their bark canoes over it and their navigation was clear to the Ohio River. There was in this region a liberal supply of game. There was also at the lower cataract a point where pike, muscalonge and sturgeon could ascend no further. They were easily caught, and were of nearly as much value to the Indian, as the deer, elk, bear and turkey of the forest.

Heckwelder says that in 1786 the fish of the lower chute were wonderfully numerous.

Around the junction of the two rivers the scenery is more striking than is usual in Northern Ohio, which probably induced the author of Castle Gregory to locate here the love scenes of Roy and Cora.

In the war of 1812 it was the rendezvous of the troops, furnished by the Western Reserve. But my present purpose is not in the line of history and romance.

The walls of this gorge, canyon or glen, give the geologist an excellent opportunity to examine the strata, next below the coal measures of the vicinity. He dwells longer, however, and with interest, upon the phenomena of the drift or glacial period; an era when the climate of Greenland extended to northern Ohio.

In the vicinity of the forks of the Cuyahoga River the general direction of the ice movement was nearly south-east. On the conglomerate bluff, along Sherbondy Hill, overlooking Akron from the southwest, the bearing of the stria varies from S. 10 degrees to S. 35 degrees E., with an average of about S. 22 degrees E.

On the same rock, in Northampton east of the Cuyahoga, the mean of the several observations is about S. 40 degrees E.

At the railroad crossing of this river, north of Cuyahoga Falls, the bearing is S. 45 degrees E., and on the summit of Coal Hill in Tallmadge, S. 35 degrees E.

Before they were broken up by the early settlers, and calcined for white lime, there were in the townships of Bath and Northampton, numerous blocks of fossiliferous limestone, of the islands at the west part of Lake Erie. One of them was nearly as large as some of the log cabins of the pioneers. Their edges were but little worn, which implies that they had not been moved a great distance; but also that they had not been subjected to much of the

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tumbling process. Probably they were transported on floes of ice, towards the close of the glacial period. In some of these blocks there were bands of gypsum; showing that their home was on the north side of Sandusky Bay, at or near the quarries. The general course of these boulders, from the islands where they were *in situ* to the valley of the Cuyahoga, corresponds closely with the bearing of the drift stria.

No observer has given more attention to the subject of pre-glacial valleys and water channels in Northeastern Ohio than Prof. M. C. Read, of the late Geological Survey of Ohio. In a recent letter he states that he has a part of the materials for a map of these ancient valleys, but more observations are necessary to complete it. One of these lines of pre-glacial drainage he regards as embracing the heads of the Nimishillen, its waters then flowing northward through Turkey Foot Lake, taking in the Upper Tuscarawas; and thence by the way of Summit Lake through Akron, on the line of the Ohio Canal, forming there the channel of the main Cuyahoga. Another stream ran northerly through Springfield Lake, joining the Little Cuyahoga, which had an independent channel or channels, near the line between Tallmadge and Portage townships, and thence through Silver Lake and Turtle Lake, along the valley of Mud Creek to that of Brandywine Creek, and the Cuyahoga at Sangamon. The present course of the Cuyahoga from Kent to the Old Forge, he regarded as post-glacial; also that of the Little Cuyahoga from Middlebury to the forks at Old Portage.

He finds evidence of several branches, through which the waters of the pre-glacial Cuyahoga flowed. These channels may be traced by a succession of lakes and swamps that now occupy the depressions of the country. As the general ice movement crossed these valleys from the northwest, at oblique angles 30 to 60 degrees, the loose materials brought on by the universal glaciers naturally fell into the lowest places, a process which obliterated, or nearly obliterated, many of them.

Prof. Read regards much of his work as preliminary, requiring more field work for its completion. Until this is done, something must be left to the opinions of observers, and even to their imagination.

Whoever enters upon the investigation in detail should bear in mind that the ice period was a long one; that its coming on was slow, and that its disappearance was proportionately tardy. If it was due to the revolution of the line of the apsides the period was 21,000 years.

The intermediate or *inter-glacial* period must have had special and temporary lines of drainage, which it may be difficult to separate from those of *pre,* as well as *post*-glacial times. The ice mass covered this country, not by its southerly movement alone, but by continual increase, due to falls of snow beyond its borders. Such an accumulation overlapping the ice field, and the region in its front became *neve,* and soon formed part of the mass. If the precipitation was no greater than it is now, and in the form of snow, it would accumulate not less than four feet per year, or 400 feet in a century. But during the ice period there was some flow of water *beneath* the general glacier. Around its advancing front, or its retiring front, heavy streams of great turbulence and force found their way along the lowest depressions. If these streams became permanent, or for such of them as did so, new and special valleys were formed by erosion.

Prior to the approach of the era of ice the climate of the valley of the Ohio must have been similar to the present.

The superficial materials resting upon the indurated rocks would then be the same as they now are, on and across the river Ohio to the south beyond the ice area. In general the soil would be rich, supporting a heavy growth of deciduous trees and herbage.

Such a vegetation sustained and sheltered a large number of animals, insects and reptiles. It is probable that among them existed cave dwelling-man, not much elevated above the animals which he hunted.

The superficial materials and the soil of pre-glacial times were due to climatic, chemical and water action, as alluvion is now formed. The continental glacier could not have swept away all of this archaic alluvium, but left it very much mixed, modified and concealed, by the glacial drift. Along the border of the ice front in central and southern Ohio, the two forms of deposit are capable of identification, and within the ice area a careful study should bring to light the remains of the pre-glacial or archaic alluvium. In article No. 197 of the Smithsonian contribution for 1864 may be found a list of a number of instances of timber, sticks and leaves buried in the earth at points within and along the drift boundary.

Most of them are deciduous, though

there are several cases of evergreens. Though not fossilized they have certain characteristics of fossils in settling the age of the deposits by which they are covered. Where the timber and muck beds are heavy they could not have been transported very far. Many of them are evidently ancient swamps that have not been much disturbed, but only covered. In the driftless region on and south of the Ohio buried timber is rare and generally in close proximity to water channels, either ancient or modern.

In the belt near and below the edge of the ice field is found the most numerous and heavy timber and muck beds. The most conspicuous ones are on the upland, which Prof. Orton has described in detail for Southwestern Ohio in his reports on the Local Geology. Unless the materials underlying these beds show striated stones or other proof of drift action, I am inclined to regard the timber as the growth of the pre-glacial or inter-glacial period, on or near the place where it was entombed.

The clays, gravel, sand or mixtures of them beneath should belong to the archaic alluvium. To take them out of that formation requires direct evidence of drift or glacial action.

On both sides of the Cuyahoga around Earlville, north of Kent, the country is entirely Morainic. Its surface is undulating with knolls and ridges, and swamps and lakes; which may be seen at and around Brady's Lake. The river at the bridge near Earlville, is reported to be 474 feet A. L. E. The drift knolls and ridges are 40 to 60 feet higher, or 500 to 520 feet above Lake Erie.

At the center of Stow, five miles west of Kent, is a gorge quite similar to the one there; but now generally without water. It is wholly in the conglomerate, with straight, vertical walls, bold and dark, leading to the river below. It is over one half a mile in length, and points in the direction of Long Swamp in Tallmadge. There must have been a time when a large body of water was discharged through it. The present rivulet is wholly unequal to the erosion of a channel so pronounced. There are signs of an inter-glacial channel, from a bend of the river below Kent at the mouth of Plumb Creek, along the Connotton railway, to near Mogadore.

The highest part of this depression is about 500 ft. A. L. E., and about the same as the Cuyahoga at the gorge at Kent. Around its southerly debouche in Suffield is a gravel and sandy plain, its surface 50 to 70 feet above the Little Cuyahoga. To the eastward through Suffield and northward in Brimfield, Moraine ridges, swamps and valleys are conspicuous. There are evidences of a similar channel along the line of the N. Y. P. & O. Railway where it leaves the valley of the Cuyahoga, below the town of Kent. Its course is visible from the summit to the station at Tallmadge into Camp Brook. Nearly parallel with it, about a mile west of the station, is another extending through long swamp from the Cuyahoga to Camp Brook, its present surface elevation being the same or about 500 feet above Lake Erie.

It should also be considered that in inter-glacial times, rapid changes occurred in the volume of water, requiring channels of discharge, that may not have been permanent. For instance, as the ice covered area diminished, its front would be nearly at right angles to its line of motion, as indicated by the stria, that is northeast and southwesterly. This motion did not cease during the period of retreat. While the main Cuyahoga was filled with ice up to Old Portage, the country to the east including the Valley above Kent, may have been nearly bare. The surplus water of this field would flow easterly over the Ravenna Summit, into the valley of the Mahoning, or southerly and around the margin of the ice field. That part of the valley between Kent and Cuyahoga Falls, is about on a level with the gap at Summit Lake, that is about 400 feet above Lake Erie.

The country along the valley of the Little Cuyahoga, would soon fill up, forming a pool or temporary Lake, that might have a discharge southerly, over the summit into the valley of the Tuscarawas, until the Cuyahoga Valley was cleared.

Dr. M. Jewett, of Akron, has devoted much time to the study of the phenomena of the ice period in that vicinity. He finds evidence of a deep and broad, ancient water way, from the Cuyahoga near the suspension bridge to the Little Cuyahoga at the Old Forge, near where the railways cross that stream. It was capacious enough to allow a large volume of water to pass. At its southerly termination is a large accumulation of coarse drift gravel and sand, covering one-fourth of a township. Camp Brook has formed a channel coming from the east along its northern border to the Little Cuyahoga at the railroad crossing. This deposit extended southerly past Middlebury, with a thickness in places of at least 100 feet.

The Little Cuyahoga lies along

its western margin to the Old Forge and powder works, and thence along its southern margin, bearing to the northwest and the forks of the two rivers.

There are many lateral gullies and ridges, the results of post-glacial drainage, but the general elevation is quite regular, 350 to 400 feet above Lake Erie.

This very heavy deposit graduates into another which is higher and of a clear Morainic character, with knolls and depressions, sometimes rising to 500 feet above the lake. As it is in Wisconsin these "Kettle Moraines" constitute the highest of the drift deposit, and the material shows less of the assorting action of water. The best examples in this region may be seen in the township of Randolph, 10 miles east. There are nowhere in Ohio as perfect and striking as those in Wisconsin, especially on the waters of Green Bay; but ours are plain enough to show the same origin.

While viewing the Moraine cavities near the head of the Ocouto and Wolf rivers in 1849, I was impressed with the thought that they could be due to no other cause *than subsidence* in a mass of ice and earthly matter, where the proportions were nearly equal. As the country regained its normal temperature, and the ice blocks was dissipated by melting, the places where ice predominated formed sinks or hollows, with ridges and knolls between.

This view was published repeatedly and has not been denied, but is now generally accepted. Depressions originating in this way may be seen to the east of the "Chuckery," but the corresponding ridges are not conspicuous.

The query arises in the mind of every observer, how to classify the different deposits of the ice era.

It is a much more difficult question than the stratification of the indurated rocks. Prof. Wright has found no trouble in defining the southern border of the ice field by means of the till, which is easily distinguished from the soft materials overlaying the rocks farther south. I am inclined to regard the coarse, rounded boulder, gravel and sand, of the westerly part of Tallmadge, and the easterly portion of Portage towships, as *inter glacial* Everything indicates a powerful current through the ancient channel described by Dr. Jewett, connecting the two Cuyahogas near the Old Forge on the town line. The gravel plains, hollows and ridges to which I have referred have the semblance of a delta around the debouche of this channel.

Moraines may be due to the period of the advancing ice, or to its retreat. During the latter period the assorting and transporting force of water came into play, producing deposits of round stones, gravel, sand and laminated clays. The coarser ones, not stratified where the stones are less rounded and the clay compact, are of the glacial time. Although the general topography of the country before the era of ice was similar to the present, the surface deposits were much less. These were not entirely obliterated but much mixed by the universal glacier. The valleys became less ragged and the summits somewhat worn and rounded. I may be asked how the change of this channel of the main Cuyahoga, below the village, was brought about. To any reply there must be some things hypothetical. The lower face of the pebbly sandstone or conglomerate, is not very regular locally. It is a coarse bedded formation, roughly deposited upon the soft and yielding shale beneath. Its general stratification is, however, quite regular, dipping southerly and easterly.

Near the lower dam and near the head of the abandoned race-way its base is 366 feet above Lake Erie. About a mile down the race, nearly opposite the 'Old Maid's Kitchen", it is 368 feet and on the Little Cuyahoga north of the crossing of the Valley Railway, and the N. Y. P. & O., it is 362 feet. The thickness is quite irregular, varying from 80 to 120 feet.

If it was 100 feet thick below the Kitchen, its surface would have been about 470 feet above Lake Erie. While the basin existed around the forks filled to a heighth between 400 and 500 ft. the country eastward bordering the Cuyahoga would be flooded to the Ravenna summit and when the valley of the river below the forks became clear, the stream or a part of it might flow over the conglomerate in that vicinity. In that event the shale beneath would give way rapidly, and large blocks of rock would fall into the chasm, such as now lie along its sides in great numbers. From the foot of the gorge at Kent the abandoned Pennsylvania & Ohio Canal had a long level extending through the village of Cuyahoga Falls about 465 feet above Lake Erie, the reputed elevations varying somewhat. A slight obstruction in the drift country south of Cuyahoga Falls would raise the waters to the surface of the conglomerate and divert it westward where it now flows.—*Akron Beacon, July* 3, 1885.

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